

IN THE CLAIMS:

1 1. (Currently Amended) A method for establishing identity in a file system, comprising:
2 receiving, from a client, a first Network File System (NFS) operation concerning
3 an indicated file, the first NFS operation received by a proxy;
4 forwarding the first NFS operation from the proxy to be received by a file server;
5 returning a NFS file handle associated with the first NFS operation from the file
6 server to the proxy in response to the file server receiving the first NFS operation from
7 the proxy;
8 inserting, by the proxy, metadata into the NFS file handle in response to receiving
9 the NFS file handle from the file server, wherein the metadata is an encryption key;
10 sending, by the proxy in response to receiving the NFS file handle from the file
11 server, the NFS file handle with the metadata inserted in the NFS file handle to the client
12 as a reply to the first NFS operation; ~~and~~
13 using, by the client, the metadata and the NFS file handle in a second NFS
14 operation to identify the client and the indicated file; and
15 receiving, from the client, the second NFS operation by the proxy, the second
16 NFS operation comprising the metadata sent with the second NFS operation;
17 identifying, in response to the metadata, the client as having a permission to
18 submit the second NFS operation;
19 sending the second NFS operation to the file server and not sending the metadata
20 to the file server; and
21 receiving, by the proxy, a further NFS reply from the file server, and sending, by
22 the proxy, the further NFS reply to the client.

1 2. (Previously Presented) The method of Claim 1, whereby using the metadata in the
2 NFS file handle eliminates a need for the proxy to generate additional requests to the file
3 server to establish file identity, and for completing client requests.

1 3. (Previously Presented) The method of Claim 1, further comprising:
2 encoding metadata in a form of a session key into the file handle, the session key
3 expiring after a predetermined amount of time.

1 4. (Previously Presented) The method of Claim 1, further comprising:
2 using an NFS file system as the file system.

1 5. (Previously Presented) The method of Claim 1, further comprising:
2 using a stateless protocol by the file system.

1 6-29. (Cancelled).

1 30. (Previously Presented) The method of claim 1, wherein the NFS file handle is of a
2 variable size~~further comprising:~~
3 ~~receiving, from the client, a second NFS operation by the proxy, the second NFS~~
4 ~~operation comprising the metadata in a further NFS file handle sent with the second NFS~~
5 ~~operation;~~
6 ~~identifying, in response to the metadata, the client as having a permission to~~
7 ~~submit the second NFS operation;~~
8 ~~sending the second NFS operation to the file server and not sending the metadata~~
9 ~~with the second NFS file handle to the file server; and~~
10 ~~receiving by the proxy a further NFS reply from the file server, and sending by~~
11 ~~the proxy the further NFS reply to the client.~~

1 31. (Previously Presented) A method for establishing identity in a file system,
2 comprising:
3 receiving a first file request concerning an indicated file from a client, the first file
4 request received by a proxy;
5 forwarding the first file request from the proxy to a file server;

6 returning a reply associated with the first file request from the file server to the
7 proxy, wherein the reply includes a file handle associated with the indicated file;
8 inserting, by the proxy, metadata into the file handle;
9 sending, by the proxy, the file handle with the metadata inserted in the file handle
10 to the client, the metadata to be used in further requests to identify the client as having a
11 permission to access the indicated file;
12 receiving, from the client, a second file request by the proxy, the second file
13 request including the metadata in a second file handle sent with the second file request;
14 identifying, in response to the metadata, that the client has the permission to
15 submit the second file request;
16 sending the second file request to the file server and not sending the metadata
17 with the second file handle to the file server; and
18 receiving by the proxy a second reply from the file server, and sending by the
19 proxy the second reply to the client.

1 32. (Previously Presented) An apparatus to establish identity in a file system,
2 comprising:

3 a proxy configured to receive a first Network File System (NFS) operation
4 concerning an indicated file sent by a client to the file system, the proxy further
5 configured to forward the first NFS operation to be received by a file server;

6 the file server configured to return a NFS file handle associated with the first NFS
7 operation to the proxy in response to the file server receiving the first NFS operation
8 from the proxy;

9 the proxy further configured to insert metadata into the NFS file handle in
10 response to receiving the NFS file handle from the file server, wherein the metadata is an
11 encryption key; and

12 the proxy further configured to send the NFS file handle with the metadata
13 inserted in the NFS file handle to the client as a reply to the first NFS operation, the
14 metadata and the NFS file handle to be used in a second NFS operation to identify the
15 client and the indicated file.

- 1 33. (Previously Presented) The apparatus as in claim 32, further comprising:
2 the proxy further configured to receive, by the client, a second NFS operation, the
3 second NFS operation comprising the metadata in the second NFS file handle sent with
4 the second NFS operation;
5 the proxy to identify, in response to the metadata, the client as having a
6 permission to submit the second NFS operation;
7 the proxy to send the second NFS operation to the file server and not to send the
8 metadata with the second NFS file handle to the file server; and
9 the proxy to receive a second NFS reply from the file server, and the proxy to
10 send the second NFS reply to the client.
- 1 34. (Previously Presented) The apparatus of Claim 32, further comprising:
2 the proxy to use the metadata in the NFS file handle received from the client to
3 eliminate a need for additional communication with the file server to establish file
4 identity.
- 1 35. (Previously Presented) The apparatus of Claim 32, further comprising:
2 the proxy to encode the metadata in a form of a session key into the NFS file
3 handle, the session key expiring after a predetermined amount of time.
- 1 36. (Previously Presented) The apparatus of Claim 32, further comprising:
2 an NFS file system used as the file system.
- 1 37. (Previously Presented) The apparatus of Claim 32, further comprising:
2 a stateless protocol used by the file system.
- 1 38. (Previously Presented) A non-volatile memory executed on a computer, comprising:
2 the non-volatile memory containing procedures for execution on the computer for
3 a method of establishing identity in a file system, the method having the steps of,

4 receiving, from a client, a first Network File System (NFS) operation concerning
5 an indicated file, the first NFS operation received by a proxy;

6 forwarding the first NFS operation from the proxy to be received by a file server;

7 returning a NFS file handle associated with the first NFS operation from the file
8 server to the proxy in response to the file server receiving the first NFS operation from
9 the proxy;

10 inserting, by the proxy, metadata into the NFS file handle in response to receiving
11 the NFS file handle from the file server, wherein the metadata is an encryption key; and

12 sending, by the proxy in response to receiving the NFS file handle from the file
13 server, the NFS file handle with the metadata inserted in the NFS file handle to the client
14 as a reply to the first NFS operation; and

15 using, by the client, the metadata and the NFS file handle in a second NFS
16 operation to identify the client and the indicated file.

1 39. (Previously Presented) A method for establishing identity in a file system,
2 comprising:

3 receiving a first file request concerning an indicated file from a client, the first file
4 request received by a proxy;

5 forwarding the first file request from the proxy to a file server;

6 granting a permission for the request to be acted upon by the file system in
7 response to a predetermined protocol;

8 returning a reply associated with the first file request from the file server to the
9 proxy, wherein the reply includes a file handle associated with the indicated file;

10 inserting, by the proxy, a session key into the file handle; and

11 sending, by the proxy, the file handle with the session key inserted in the file
12 handle to the client, the session key to be used in further requests to identify the client
13 and the indicated file.

- 1 40. (Previously Presented) The non-volatile memory of Claim 38, further comprising:
2 receiving, from the client, a second NFS operation by the proxy, the second NFS
3 operation comprising a session key in a second NFS file handle sent with the second NFS
4 operation;
5 identifying, in response to the session key, that the client has the permission to
6 submit the second NFS operation;
7 sending the second NFS operation to the file server and not sending the session
8 key with the second NFS file handle to the file server; and
9 receiving by the proxy a second NFS reply from the file server, and sending by
10 the proxy the second NFS reply to the client.
- 1 41. (Previously Presented) The non-volatile memory of Claim 40, further comprising:
2 causing the session key to expire after a selected amount of time.
- 1 42. (Previously Presented) The non-volatile memory of Claim 40, further comprising:
2 causing the session key to expire after a selected amount of usage.
- 1 43. (Previously Presented) The non-volatile memory of Claim 38, further comprising:
2 using a NFS file server as the file server.
- 1 44. (Previously Presented) The non-volatile memory of Claim 38, further comprising:
2 using a two way communication exchange between the proxy and the file server.
- 1 45. (Previously Presented) An apparatus to establish identity in a file system,
2 comprising:
3 a proxy to receive a file request sent by a client to the file system, the proxy to
4 forward the request to a file server;
5 the file server to return a reply associated with the file request to the proxy,
6 wherein the reply includes a file handle;
7 the proxy to insert a session key into the file handle; and

8 the proxy to send the file handle with the session key inserted in the file handle to
9 the client, the session key to be used in further requests to identify the client and the
10 indicated file.

1 46. (Previously Presented) The apparatus as in claim 45, further comprising:
2 the proxy to receive, by the client, a second file request, the second file request to
3 include the session key in a further file handle sent with the second request;
4 the proxy to identify, in response to the session key, the client as having a
5 permission to submit the another file request;
6 the proxy to send the second request to the file server and not to send the session
7 key with the second file handle to the file server; and
8 the proxy to receive a further reply from the file server, and the proxy to send the
9 further reply to the client.

1 47. (Previously Presented) The apparatus of Claim 45, further comprising:
2 the proxy to use the metadata in the file handle received from the client to
3 eliminate a need for additional communication with the file server to establish file
4 identity.

1 48. (Previously Presented) The apparatus of Claim 45, further comprising:
2 the proxy to encode the metadata in a form of a session key into the file handle,
3 the session key expiring after a predetermined amount of time.

1 49. (Previously Presented) The apparatus of Claim 45, further comprising:
2 an NFS file system used as the file system.

1 50. (Previously Presented) The apparatus of Claim 45, further comprising:
2 a stateless protocol used by the file system.

1 51. (Previously Presented) An apparatus to establish identity in a file system,
2 comprising:

3 a proxy configured to receive a first file request sent by a client to the file system,
4 the proxy further configured to forward the first file request to a file server;
5 the file server configured to return a reply associated with the first file request to
6 the proxy;

7 the proxy further configured to insert a session key into a file handle;
8 the proxy further configured to send the file handle with the session key inserted
9 in the file handle to the client, the session key configured to be used in a second file
10 request to identify the client and the indicated file;

11 the proxy further configured to receive, by the client, a second file request, the
12 second file request configured to include the session key in a second file handle sent with
13 the second file request;

14 the proxy further configured to identify, in response to the session key, the client
15 as having a permission to submit the second file request;

16 the proxy further configured to send the second file request to the file server and
17 not to send the session key with the second file handle to the file server; and

18 the proxy further configured to receive a second reply from the file server, and the
19 proxy further configured to send the second reply to the client.

1 52. (Previously Presented) A method for establishing identity in a file system,
2 comprising:

3 receiving a first file request concerning an indicated file from a client, the first file
4 request received by a proxy;

5 forwarding the first file request from the proxy to a file server;

6 determining that the client has a permission to have the request acted upon by the
7 file system in response to a predetermined protocol;

8 returning a reply associated with the first file request from the file server to the
9 proxy, wherein the reply includes a file handle associated with the indicated file;

10 inserting, by the proxy, a cryptographic information into the file handle;

11 sending, by the proxy, the file handle with the cryptographic information inserted
12 in the file handle to the client, the cryptographic information to be used in one or more
13 requests to identify the client and the indicated file.

1 53. (Previously Presented) The method according to claim 52, further comprising:
2 receiving, by the client, a second file request by the proxy, the second file request
3 including the cryptographic information in a second file handle sent with the second file
4 request;
5 identifying, in response to the cryptographic information, that the client has the
6 permission to submit the second file request;
7 sending the second file request to the file server and not sending the cryptographic
8 information with the second file handle to the file server; and
9 receiving by the proxy a second reply from the file server, and sending by the
10 proxy the second reply to the client.

1 54. (Previously Presented) The method according to claim 52, further comprising:
2 causing the cryptographic information to expire after a selected amount of time.

1 55. (Previously Presented) The method according to claim 52, further comprising:
2 causing the cryptographic information to expire after a selected amount of usage.

1 56. (Previously Presented) The method according to claim 52, further comprising:
2 using a NFS protocol as the predetermined protocol.

1 57. (Previously Presented) The method according to claim 52, further comprising:
2 using as the predetermined protocol a two way communication exchange between
3 the proxy and the file server.

1 58. (Previously Presented) An apparatus to establish identity in a file system,
2 comprising:

3 a proxy configured to receive a file request for an indicated file sent by a client to
4 the file system, the proxy further configured to forward the request to a file server;
5 the file server configured to return a reply associated with the file request to the
6 proxy, wherein the reply is configured to include a file handle;
7 the proxy further configured to insert a cryptographic information into the file
8 handle; and
9 the proxy further configured to send the file handle with the cryptographic
10 information inserted in the file handle to the client, the cryptographic information
11 configured to be used in further requests to identify the client and the indicated file.

1 59. (Previously Presented) The apparatus as in claim 58, further comprising:

2 the proxy further configured to receive, by the client, a second request, the second
3 file request to include the cryptographic information in a second file handle sent with the
4 second request;

5 the proxy further configured to identify, in response to the cryptographic
6 information, the client as having a permission to submit the second file request;

7 the proxy further configured to send the second request to the file server and not
8 to send the cryptographic information with the second file handle to the file server; and

9 the proxy further configured to receive a further reply from the file server, and the
10 proxy to send the further reply to the client.

1 60. (Previously Presented) The apparatus of claim 58, further comprising:

2 the proxy further configured to use the metadata in the file handle received from
3 the client to eliminate a need for additional communication with the file server to
4 establish file identity.

1 61. (Previously Presented) The apparatus of claim 58, further comprising:

2 the proxy further configured to encode the metadata in a form of a cryptographic
3 information into the file handle, the cryptographic information configured to expire after
4 a predetermined amount of time.

1 62. (Previously Presented) The apparatus of claim 58, further comprising:
2 an NFS file system used as the file system.

1 63. (Previously Presented) The apparatus of claim 58, further comprising:
2 a stateless protocol used by the file system.

1 64. (Previously Presented) An apparatus to establish identity in a file system,
2 comprising:
3 a proxy configured to receive a first file request sent by a client to the file
4 system, the proxy to forward the first file request to a file server;
5 the file server configured to return a reply associated with the first file request
6 to the proxy;
7 the proxy further configured to insert a cryptographic information into a file
8 handle;
9 the proxy further configured to send the file handle with the cryptographic
10 information inserted in the file handle to the client, the cryptographic information
11 configured to be used in a second file request to identify the client and the indicated
12 file;
13 the proxy further configured to receive, by the client, a second file request, the
14 second file request configured to include the cryptographic information in a second
15 file handle sent with the second file request;
16 the proxy further configured to identify, in response to the cryptographic
17 information, the client as having a permission to submit the second file request;
18 the proxy further configured to send the second file request to the file server
19 and not to send the cryptographic information with the second file handle to the file
20 server; and
21 the proxy further configured to receive a second reply from the file server, and
22 the proxy to send the second reply to the client.

1 65. (Previously Presented) A method for establishing identity in a file system,
2 comprising:
3 receiving a file request concerning an indicated file from a client, the request
4 received by a proxy;
5 forwarding the request from the proxy to a file server;
6 returning a reply associated with the file request from the file server to the
7 proxy, wherein the reply includes a file handle associated with the indicated file;
8 inserting, by the proxy, metadata into the file handle; and
9 sending, by the proxy, the file handle with the metadata inserted in the file
10 handle to the client, a size of the file handle set to a sum of a length of the server file
11 handle and a length of the proxy metadata, the metadata to be used in further requests
12 to identify the client and the indicated file.

1 66. (Previously Presented) A method, comprising:
2 receiving, by a proxy, a file request for a file sent from a client;
3 forwarding the file request from the proxy to a file server;
4 returning a reply associated with the file request from the file server to the
5 proxy, wherein the reply includes a file handle;
6 inserting, by the proxy, metadata into the file handle;
7 sending, by the proxy, the file handle with the metadata inserted in the file
8 handle to the client; and
9 using, by the client, the metadata inserted into the file handle in a subsequent
10 file request to identify the client and the file.

1 67. (Previously Presented) A computer apparatus, comprising:
2 a proxy configured to receive a client file request for a file and forward the
3 file request from the proxy to a file server;
4 the server configured to return a reply associated with the file request, wherein
5 the reply includes a file handle;

6 the proxy further configured to intercept the file handle sent from the server
7 and insert metadata into the file handle to create a modified file handle;
8 the proxy further configured to send the modified file handle with the
9 metadata inserted in the file handle to the client; and
10 the proxy further configured to receive the modified file handle from the client
11 for a second file request for the file, wherein the proxy is further configured to use the
12 modified file handle to eliminate a need for the proxy to generate one or more
13 additional requests to the server that would be required to access the file if the
14 modified file handle did not include the inserted metadata.